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86-534

Supreme Court, U.S.
FILED
SEP 29 1986
JOSEPH F. SPANIOL, JR.
CLERK

No.

IN THE

Supreme Court of the United States

OCTOBER TERM, 1986

CBS INC.,

Petitioner,

vs.

MOLECULON RESEARCH CORPORATION,

Respondent.

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

(OVERSIZED PATENT APPENDIX)

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United States Patent [15] 3,655,201
Nichols [45] Apr. 11, 1972

[54] PATTERN FORMING PUZZLE AND METHOD WITH PIECES ROTATABLE IN GROUPS

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[22] Filed: Mar. 4, 1970
[21] Appl. No.: 16,473

[52] U.S. Cl. ..... 273/153 R, 46/25
[51] Int. Cl. A63f 9/08
[58] Field of Search ..... 273/155, 156, 157 R, 153 R; 35/22 R; 46/24, 25

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Primary Examiner—Anton O. Oechsle
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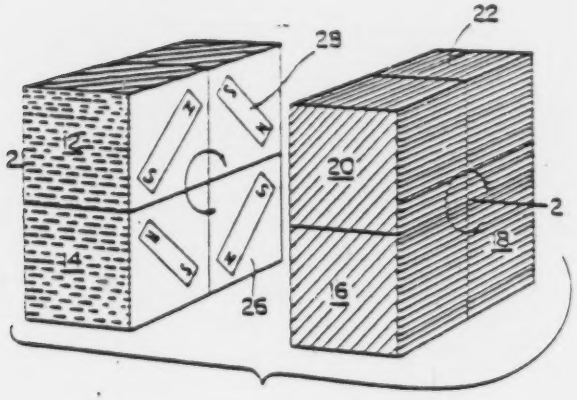
[57] ABSTRACT

Eight cube-type pieces are magnetically engaged to form a cube-type assembly with educational and entertaining features. The cubes are adapted to rotate in complementary sets of four about one of three mutually perpendicular axes. Each cube has colored surfaces and when properly arranged one distinct color on each of the six faces is presented. Each set which shares one face of the assembly may be rotated in multiples of 90° with respect to the other set. If the assembly is initially arranged properly and then disarranged by a random sequence of rotations, it then serves as a device whose object is the restoration of the original arrangement.

10 Claims, 6 Drawing Figures



Patented April 11, 1972 3,655,201

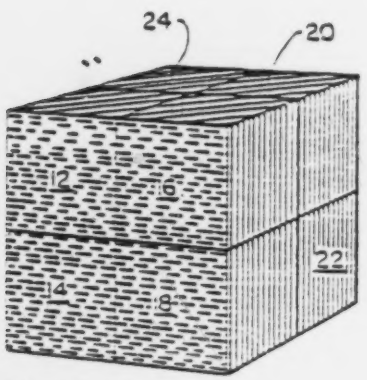


FIG. 1

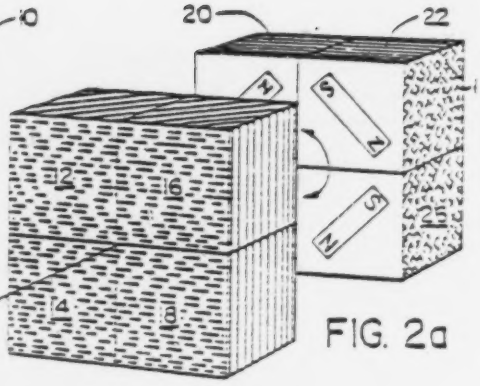


FIG. 2a

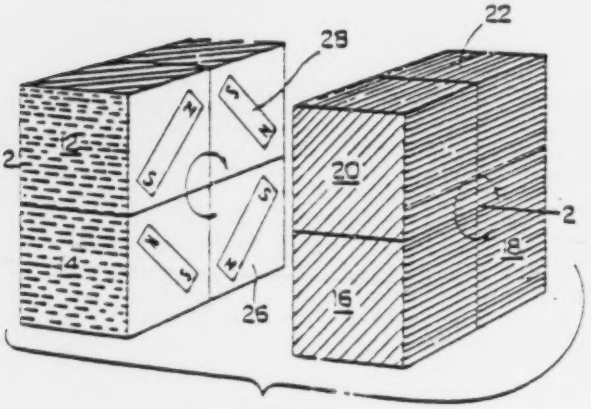


FIG. 2b

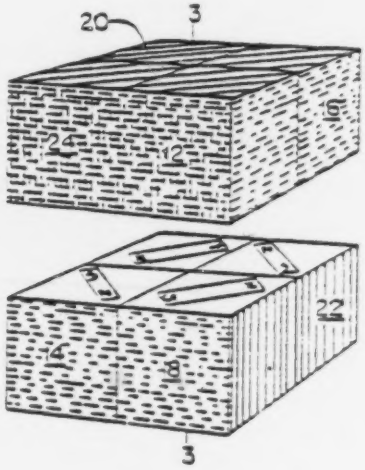


FIG. 2c

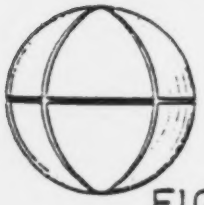
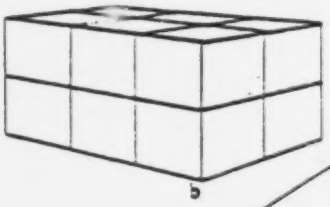


FIG. 4



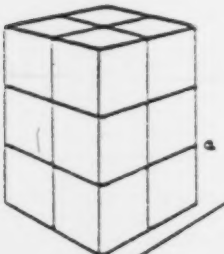


FIG. 3

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PATTERN FORMING PUZZLE AND METHOD WITH PIECES ROTATABLE IN GROUPS

SUMMARY OF THE INVENTION

This invention relates to a device which may be utilized as a new form of puzzle in which portions of an assembly of engaged mobile pieces are rotated relative to one another about various axes in an effort to achieve certain predetermined arrangements of the pieces. Aside from its entertaining aspects, the device also finds application in the educational field to demonstrate the effect of repetitive operations on symmetrical structures, and particularly to demonstrate noncommutative operations in which the final result depends on the order of the individual steps; such noncommutative operations are fundamental to modern mathematics and science. The device may also be used to provide practice in the comprehension and visualization of complex spatial structures and to promote training in the application of algorithms to problem solving; it poses certain problems best solved by previous mastery of important algorithmic sequences of operations. It can also be expected that this device, like many other puzzles combining manual and mental skills, will prove useful in psychological and psychiatric testing programs.

Briefly, the invention comprises a set of internally engaged and externally decorated pieces assembled into a structure which constantly poses a choice between two or more distinct manual operations, each consisting of rotation of one set of pieces with respect to the remainder, and each leading to a different subsequent arrangement of pieces and another choice of alternative operations. In particular, the invention includes such devices wherein the engagement is provided by mechanical or magnetic means providing structural integrity without restriction of rotational freedom, and wherein each piece is colored or patterned on its exposed surfaces in a way which allows its arrangement, with the other pieces, into a recognizable predetermined pattern whose establishment is the object of manipulation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of one embodiment of the invention in a three-dimensional form;

FIGS. 2a, 2b, and 2c are isometric views of FIG. 1 defining the various axes about which the various subsets of the structure may rotate;

FIGS. 3a and 3b are alternative embodiments of FIG. 1; and

FIG. 4 is an isometric view of an alternative embodiment of the invention in three-dimensional form.

DESCRIPTION OF PREFERRED EMBODIMENT

The preferred embodiment will be described in reference to a three-dimensional structure as shown in FIG. 1 which comprises a cube 10 divided into eight smaller cubes 12–26. Each cube includes an exposed surface and a nonexposed surface. The nonexposed surfaces as shown in FIG. 2 are characterized by having magnet means 28 disposed therein which are adapted releasably to engage with the nonexposed surfaces of similar cubes. As shown each of the cubes has an exposed surface which comprises three faces of the cube, each face having a different color thereon. In FIG. 1 each of the eight cubes is arranged so that the entire face of any of the six sides of the complete structure presents a uniform color. In other words, the exposed surfaces are colored so as to allow the complete cube if its component parts are properly arranged to present one distinct coloration on each of its six faces. With this embodiment of the invention, rotation of any set of four smaller cubes which share one face of the larger cube with respect to the other set of four cubes is an allowed movement or twist. That is, each such set can be rotated about a mutual axis with respect to the other set without relative movement of the individual cubes within either set. If the structure is initially arranged properly and then disarranged by a random sequence of twists about the three possible axes as shown in FIGS. 2a, 2b, and 2c, it then serves as a device whose object is the restoration of the original arrangement.

In FIG. 2a, the cubes 12, 14, 16, and 18, and the cubes 20, 22, 24, and 26 comprise respectively a first and second set which may be disengaged from one another and rotated about the axis shown by line 1—1. As shown in FIG. 2a, the second set has been twisted 90° counterclockwise from its position in FIG. 1. In FIG. 2b the cubes 16, 18, 20 and 22 form a third set and the cubes 12, 14, 24 and 26 form a fourth set, these sets being adapted to rotate about a second axis shown by line 2—2. As shown in FIG. 2b, the fourth set has been twisted 90° counterclockwise from its position in FIG. 1. Similarly referring to FIG. 2c, the cubes 12, 16, 20 and 24 form a fifth set and the cubes 14, 18, 22 and 26 form a sixth set each set again, as the others, magnetically engaged and adapted to rotate about the third axis shown by line 3—3. As shown the fifth set has been twisted 90° counterclockwise from its position in FIG. 1.

The allowed twists include rotation of any of the six sets as defined in FIGS. 2a, 2b, and 2c through 90°, 180°, or 270° with respect to its complementary set.

In FIG. 1 the device is in the solved or pattern-established position, the six faces of the cube each being a uniform and distinguishable color or pattern. As shown, the faces are colored as follows: back face black, bottom face orange, top face brown, front face silver, right face red, and left face gold. Any number of random twists of the sets one with respect to another about the different axes scrambles the pattern. The solution then requires restoring the cube to its original configuration.

Although the three-dimensional aspect of the invention has been described with reference to a cube, other geometric configurations may be used for a three-dimensional embodiment. For example, a sphere divided into eight octants represents the same concept in a different form; the octants fall into six sets in a manner similar to the cube, such as shown in FIG. 4, in that the eight octants are divided by three coordinate planes along which the various sets may be disengaged and twisted.

If desired, fewer than six colors may be used making the restoration of the predetermined pattern simpler to achieve, or other color schemes or graphic representations may be placed on the exposed surfaces of the device.

Although FIGS. 1 and 2 have been described with particular reference to eight cubes magnetically engaged and adapted to form various sets of four cubes each able to twist about a fixed axis, this effect may be multiplied in other embodiments. For example, referring to FIG. 3 additional sets of cubes are added to the basic embodiment to provide additional planes within which various sets of pieces may rotate or twist with respect to other sets. In any of these three-dimensional embodiments it is also possible to achieve engagement by mechanical rather than magnetic means, as for example by using a pop-in snap linkage, or a tongue-in-groove arrangement allowing rotation without disengagement.

What I claim is:

1. A method for restoring a preselected pattern from sets of pieces, which pieces have constantly exposed and constantly nonexposed surfaces, the exposed surfaces adapted to be combined to form the preselected pattern, which sets when in random engagement fail to display said preselected pattern which comprises:

a. engaging a plurality of pieces in a coherent structure;

b. providing a first set having at least two pieces each of said pieces having an exposed and a nonexposed surface;

c. providing a second set having at least two pieces each of said pieces having an exposed and a nonexposed surface;

d. providing a third set having at least four pieces each of said pieces having an exposed and a nonexposed surface, the third set forming with the first and second sets a composite structure, the exposed surfaces of each of the sets forming a portion of the composite preselected pattern;

e. rotating said pieces in complementary sets of four about any of three mutually perpendicular axes; and

f. repeating step (e) until the preselected pattern is achieved.

2. The method of claim 1 which includes rotating said sets about their respective axes through multiples of 90°.

3. A method for restoring a preselected pattern from sets of pieces which pieces have constantly exposed and constantly nonexposed surfaces, the exposed surfaces adapted to be combined to form the preselected pattern, which sets when in random engagement fail to display said preselected pattern which comprises:

a. engaging eight cube pieces as a composite cube;

b. rotating a first set of cube pieces comprising four cubes about a first axis;

c. rotating a second set of four cubes about a second axis; and

d. repeating steps (b) and (c) until the preselected pattern is achieved.

4. The method of claim 3 which includes rotating sets of cubes about one of three mutually perpendicular axes with reference to the composite structure.

5. The method of claim 3 wherein the sets of cubes are rotated through multiples of 90°.

6. A puzzle comprising at least eight pieces, visually distinguishable indicia on at least one face of each piece with the eight pieces together having at least two visually distinct indicia, means associated with each of the remaining faces only of each of the pieces releasably maintaining the pieces in assembled relationship forming a composite structure, said maintaining means enabling three interaffiliated groups of four contiguous pieces each to be rotated respectively about three mutually perpendicular axes, the two distinct indicia being so located on the respective pieces that the groups can be rotated to effect the display of at least two distinct indicia of the composite structure.

7. The puzzle of claim 6 wherein the composite structure is a sphere and the visually distinguishable indicia is on the exposed face only on each piece.

8. The puzzle of claim 6 wherein the means to releasably maintain the pieces in assembled relationship includes magnets.

9. A puzzle comprising eight cubes, visually distinguishable indicia on three faces only of each cubes with the eight cubes together having six visually distinct indicia,

means associated with each of the remaining faces only of each of the cubes releasably maintaining the cubes in assembled relationship forming a composite cube, said maintaining means enabling three interaffiliated groups of four contiguous cubes each to be rotated respectively about three mutually perpendicular axes,

the six distinct indicia being so located on the respective cubes that the cube groups can be rotated to effect the display of a distinct indicia on each of the six faces of the composite cube.

10. The puzzle of claim 13 wherein the means releasably maintaining the cubes in assembled relationship includes magnets.

* * * * *

March 12, 1963 W. O. GUSTAFSON 3,081,089

MANIPULATABLE TOY

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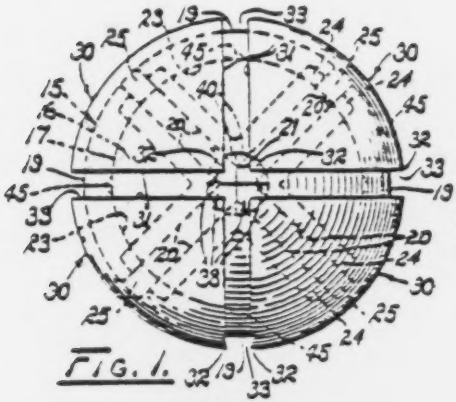

FIG. 1.

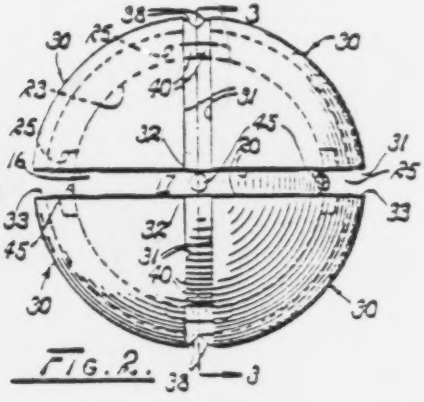

FIG. 2.

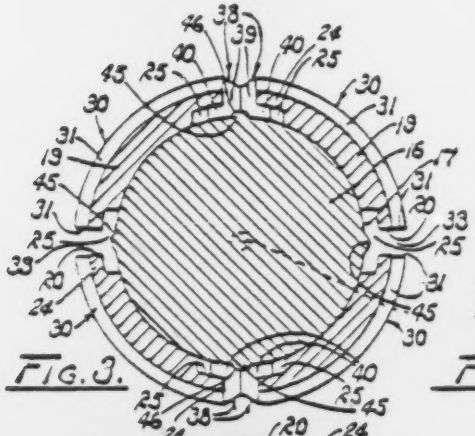

FIG. 3.

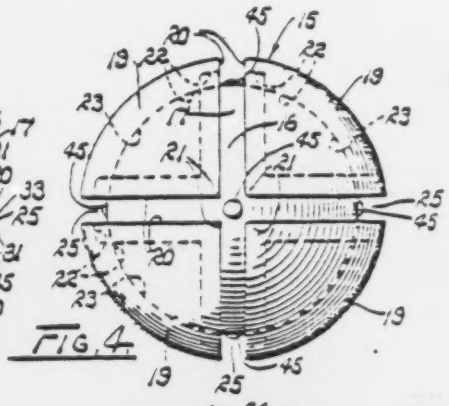

FIG. 4.

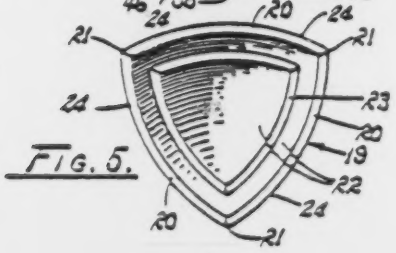

FIG. 5.

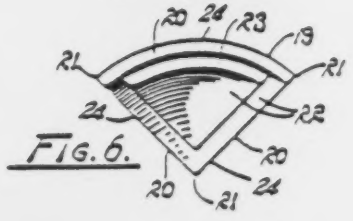

FIG. 6.

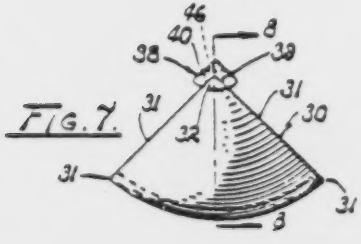

FIG. 7.

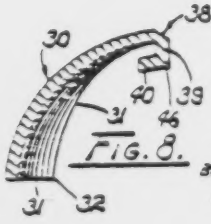

FIG. 8.

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MANIPULATABLE TOY

Filed Feb. 2, 1960 2 Sheets-Sheet 2

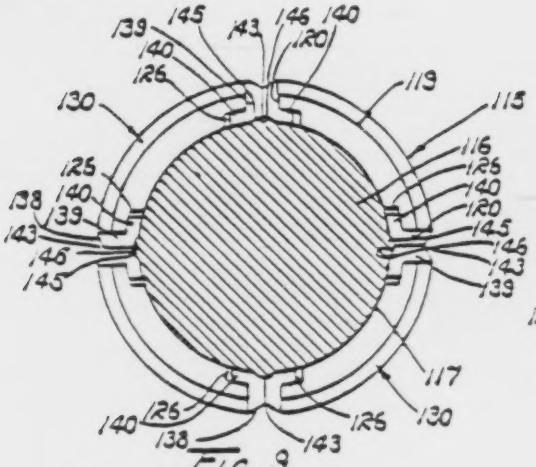

FIG. 9.

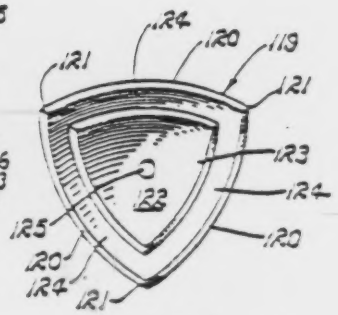

FIG. 10.

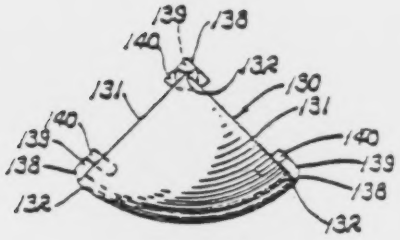

FIG. 11.

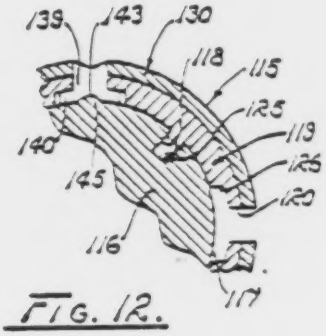

FIG. 12.

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3,081,089
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3,081,089

MANIPULATABLE TOY

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Filed Feb. 2, 1960, Ser. No. 6,323
6 Claims. (Cl. 273—156)

The present invention relates to a manipulatable toy and more particularly to a mechanical puzzle having a plurality of vari-colored parts which are movable relative to each other to form various patterns.

The present application is a continuation-in-part of my prior copending United States patent application, Serial No. 793,872, filed February 17, 1959, and now abandoned in favor of this application. It is known in puzzles to employ a plurality of parts adapted for connection or disconnection, or for relative movement, in a predetermined and possibly baffling manner, sequence, or ordered arrangement. Such puzzles challenge the user's ingenuity, manual dexterity, patience and intelligence to effect a solution. It is to this type of puzzle that the manipulatable toy of the present invention relates.

Accordingly, it is an object of the present invention to provide a manipulatable toy having a plurality of vari-colored parts movable relative to each other to form various patterns.

Another object is to provide a manipulatable toy having a plurality of movable elements in random or shuffled arrangement and which present problems of relative movement to preconceived ordered arrangement.

Another object is to provide a puzzle adapted to test color perception.

Another object is to provide a puzzle adapted to challenge the intelligence and understanding of the user.

Another object is to provide a puzzle utilizing movable parts which require manual dexterity to arrange or rearrange into predetermined positions relative to each other.

A further object is to provide a device of the character described which is in the form of a sphere having movable segments.

Another object is to provide such a toy which is easy to construct and assemble and which can be disassembled, if desired.

Other objects are to provide a puzzle or toy which is economical to manufacture, challenging to use, and which is adapted for use by persons of all ages.

These, together with other objects, will become more fully apparent upon reference to the following description.

In the drawings:

FIG. 1 is an end elevation of a puzzle embodying the principles of the present invention and showing hidden inner portions thereof in dashed lines.

FIG. 2 is a side elevation of the puzzle of FIG. 1 rotated through substantially ninety degrees from the position shown in FIG. 1.

FIG. 3 is a transverse section taken on line 3—3 of FIG. 2.

FIG. 4 is an end elevation of an internal ball-shaped member forming part of the puzzle of the subject invention.

FIG. 5 is a somewhat enlarged inside face view of an inner spherically triangular segment as utilized in the subject puzzle.

FIG. 6 is an edge view of the segment of FIG. 5.

FIG. 7 is an outside face view of an outer segment and tongue both of which form a part of the puzzle of the present invention.

FIG. 8 is a cross-section taken on line 8—8 of FIG. 7.

FIG. 9 is a view similar to FIG. 3 and showing a modified form of the subject invention.

2

FIG. 10 is a view similar to FIG. 5 showing an inner segment constituting a part of the second form of the present invention.

FIG. 11 is a view similar to FIG. 7 showing an outer segment embodying the principles of the second form of the invention.

FIG. 12 is a fragmentary radial section of the puzzle of the modified form of the subject invention.

Referring more particularly to the accompanying drawings, the puzzle of the present invention includes an inner ball-shaped member, generally indicated by the numeral 15, and including a core 16 having an outer substantially spherical surface 17, as indicated in dashed lines in FIGS. 1, 2 and 4, and in full lines in FIG. 3. The ball-shaped member also includes a plurality of substantially octantal equilaterally spherically triangular, and therefore concavo-convex, inner segments 19 of substantially uniform size and thickness. The inner segments have substantially the same spherical curvature as the core and, thus, are adapted to fit complementarily against the outer surface of the core.

Each inner segment 19 includes three side edges 20 meeting in a corresponding number of apices 21 and defining equal angles thereberween. Each inner segment also provides an inner surface 22, an inner spherically triangular mounting portion 23 edgewardly inwardly spaced from the side edges of the segment and are marginally undercut to provide marginal flanges 24. The inner surfaces of the flanges are radially offset from the inner surface of the mounting portion.

The inner surfaces 22 of the mounting portions 23 of the inner segments 19 are complementarily fitted against the outer surface 17 of the core 16 so that the inner segments are collectively in substantially spherical formation concentrically circumscribing the core. The mounting portions space the inner surfaces of the flanges 24 radially outwardly from the outer surface of the core, as best indicated in FIG. 3. Further, the adjacent side edges 20 of adjacent segments are in spaced parallel relation to each other and define three annular intersecting T-shaped grooves 25 in concentric circumscribing relation to three right-angularly related axes extended through the center of the core. That is, the grooves are individually in three perpendicularly related planes, or great circle lines of division, passing diametrically through the core 16. The grooves extend laterally under said flanges 24 as well as radially outwardly between the adjacent side edges in said described T-shaped cross-section. Thus, each groove has a maximum width between edgewardly opposed mounting portions and a minimum width between opposed side edges. Preferably, a suitable cement intimately bonds the contacting inner surfaces 22 of the segment and the outer surface 17 of the core so that the segments are rigidly connected to the core.

The puzzle also includes a plurality of substantially octantal equilaterally spherical, isosceles, triangular, outer segments 30 of the same curvature as the inner segments 19. Likewise, the outer segments provide side edges 31 meeting in apices 32. The outer segments are slidably fitted in overlaying relation against the inner segments 19 in substantially spherical formation about, and substantially enveloping the inner segments, and are concentric to the core 16. Adjacent edges of adjacent outer segments are in substanually parallel spaced relation and define three annular intersecting great circle lines of divinon in the form of slots 33 concentrically circumscribing the core. These slots are in individual planes extended diametrically through the ball-shaped member 15. These planes are in mutually perpendicular relation to each other. Preferably, the slots are of the same width as the minimum width of the grooves 25. Thus, portions of the

inner segments are visible through the slots and, when the slots are in registration with the grooves, portions of the outer surface 17 of the core 16 are visible through the slots and the grooves.

With the outer segments 30 fitted over the inner segments 19, as above described, there are provided first and second sets of hemispherically related outer segments having generally oppositely diametrically related first and second sets of adjacent apices 32 at opposite poles of the core 16. These adjacent apices are in substantially rectangular relation to each other. Polar tongues 38 are individually rigidly connected to the apices of said first and second sets of apices. The tongues include legs 39 radially inwardly extended into the grooves 25 between opposed side edges 20 and quadrant-shaped slide members 40 connected to the legs and extended transversely in the grooves under the flanges 24. The slide members are between edgewardly opposed mounting portions in slidable contact with the outer surface 17 of the core 16 and the inner surfaces 22 of the flanges 24, all as best seen in FIGS. 1 and 3. As best indicated in FIG. 1, however, the slide members of each adjacent set of apices are in interfitted relation and collectively are in substantially circular formation having a diameter greater than the minimum width of the grooves but less than the maximum width of the grooves. It will be evident that the outer segments 30 are slidably connected to the inner segments 19 but that a tongue 38 extends only from one apex 32 of an outer segment.

Detents 45 are extended outwardly from the core 16 in the grooves 25 and substantially centered between the adjacent apices 21 of the inner segments at opposite poles of the three axes defined by the grooves. The slide members 40 collectively provide sockets 46 individually adapted to receive the detents upon movement of the outer segments 30 into positions with the slide members overlaying the detents.

Preferably, the core 16, and the inner and outer segments 19 and 30, as well as the tongues 38, are made of either hard or soft plastic, but other materials may be employed, as will be apparent. Still further, the outer surface 17 of the core, and the outer surfaces of the segments are of a variety of colors. The outer surface of the core may be of a single color or have bands or sectors of various colors. Likewise, each segment may be of a single color or have bands or sectors of various colors.

Operation

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point.

The described first and second sets of hemispherically related outer segments 30 may be individually rotated about a common axis extended diametrically of the core 16 substantially through the centers of the interfitted slide members 40. The outer segments are connected to the inner segments 19 and maintained in collective spherical formation about the inner segments because of the interlocking association between the slide members 40 and the flanges 24 of the inner segments, that is, because the slide members are confined between said flanges and the core, as illustrated in FIGS. 1 and 3. This applies, of course, whether the slide members are located at the intersections of the grooves 25, or at other positions along any one of the grooves, because the flanges always overlay the slide members. However, each of the outer segments can be separated from the ball-shaped member 15 by flexing the flanges outwardly, as may be visualized in FIG. 3, to allow the tongue 38 on said outer member to be slipped outwardly of the groove and from under the flange. This, of course, assumes that the outer segments and particularly the flanges thereof are made of flexible material. It is also well to note at this point that the inner and outer segments are assembled and connected to the core in one of two ways. First, and prior to cementing the inner segment to the core, the slide member of the outer segment is fitted under the flange of the inner segment at one of the apices 21 of the inner segment and so that the segments are substantially congruent. Thus, with this method of assembly, both of the segments are applied to the core at the same time. Alternatively, the inner segments are cemented to the core in the described positions and, thereafter, the outer segments are applied by flexing the flanges outwardly and inserting the slide members under the flanges in a manner now believed evident.

Additionally, the outer hemispherically segments 30 may be collectively rotated about any one of the three axes of the grooves 25. Of course, it is necessary to move the first and second sets of outer segments in small increments relative to each other in effecting collective rotation. When the sockets 46 fit over the detents 45, a slight clicking sound occurs, in addition to a vibration imparted to the user's fingers. This informs the user of the relative positions of the inner and outer segments 19 and 30 and of his progress in rotating the outer segments. At any intersection of the grooves 25, the first and second sets of outer segments may be individually rotated about core axes extended through said points of intersection, as described above.

Second Form

With particular reference to FIGS. 9, 10, 11, and 12 a ball-shaped member 115 includes a spherical, solid core 116 having an outer surface 117. This core has a plurality of elongated bores 118 extended radially inwardly from the outer surface of the core at predetermined positions about the periphery of the core. There are four pairs of bores in the illustrated embodiment, only one of which is shown in FIG. 12. Each pair of bores is in coaxial alignment and each of said axes extends through the center of the core. Said axes are in perpendicular relation to each other so that the axes of adjacent bores intersect in ninety degree angular relation to each other.

A plurality of substantially equilateral, spherically triangular, inner segments 119 are provided, as before. These inner segments have a plurality of side edges 120 meeting in apices 121. The inner segments also have inner concave surfaces 122, inner mounting portions 123 inwardly spaced from the side edges, marginal flanges 124, and elongated pins 125 integrally connected to the inner mounting portions centrally of the segments and extended radially inwardly from the mounting portions.

The inner surfaces 122 of the mounting portions 123 are complimentarily fitted against the outer surface 117 of the core 116 with the pins 125 individually fitted in the bores 118. Prior to fitting of the inner segments against the core, the inner surfaces and the pins are preferably coated with a liquid bonding cement. Obviously, the outer surface of the core and the bores may also be given a thin coating of liquid cement so that when the segments are fitted in the described manner against the core, the segments are adherently bonded to the core. Because of the location of the bores and the fitting of the pins therein, the segments are automatically collectively fitted in substantially spherical formation in concentrically circumscribing relation to the core. This fitting could be assured to an even greater degree by making the pins and bores non-circular. The relationship between the inner segments and the core is the same as that previously described and is not considered in any greater detail at this point except to note that three annular intersecting T-shaped grooves 126 are again defined by the core and the inner segments.

The second form of puzzle also includes a plurality of substantially equilateral, spherically triangular, outer segments 130 having the same shape as the outer segments 30 of the first form of the present invention. These outer segments have side edges 131 meeting in apices 132. In the illustrated embodiments, there are eight inner and outer segments 119 and 130 with the inner segments individually overlying the bores 118.

However, tongues 138 are provided at each of the apices 132 of each of the outer segments 130. As before, these tongues include legs 139 outwardly extended from the apices and slide quadrants 140 transversely extended from the legs relatively inwardly of the outer segments. The outer segments are slidably fitted in overlying relation against the inner garments 119 and complimentary thereto so as to provide a plurality of sets of adjacent apices 132. The adjacent quadrants at the intersections of the grooves 126 are interfitted in circular formation in the same manner as that illustrated in FIG. 1 and described in connection with the first form of the present invention. Of course, since tongues are provided at each apex, there are adjacent interfitted apices at each of the intersections of the grooves. The side edges 131 of adjacent outer segments 130 are in spaced parallel relation and provide annular, intersecting slots 143.

The core 116 also has a plurality of detents 145 extended outwardly from the outer surface 117 and centered between adjacent apices 121 at the intersections of the grooves 126. The slide quadrants have sockets 146 adapted to receive the detents individually therein when the sockets are located at the intersections of the grooves, as previously described in connection with the first form of the invention.

It is to be understood that the outer segments 130 are assembled in the puzzle in the following manner. Prior to connection of the inner segments 119 to the core 116, the outer segments are placed in overlaying congruent relation with the inner segments and with the slide members 140 underlaying the flanges 124 at the apices 121 of the inner segments. Thus, when the inner segment is attached to the core, the outer segment is automatically positioned in proper location.

While the foregoing procedure is preferred, alternatively, the flanges 124 and outer segments 130 and tongues 138 are sufficiently flexible to enable the outer segments and tongues to be fitted over the inner segments after the latter have been attached to the core 116.

The puzzle is operated in substantially the same manner as that described in connection with the first form of the invention. That is, the outer segments 130 can be collectively, incrementally rotated about any one of the three axes concentrically circumscribed by the grooves 126. This is accomplished by moving the four sets of collectively interfitted slide quadrants 140 located in any one of the grooves 126 about the core 116 in said groove while the opposite sets of collected slide quadrants diametrically oppositely related to each other simply turn about their respective detents 145 on the axis of the groove traversed.

When the three slots 143 are individually in registration with the three grooves 126, that is, when the outer segments 130 are individually in congruent overlaying relation to the inner segments 119, either set of four outer segments constituting a hemisphere can be independently rotated about the core. Thus, it is evident that by employing various colors for the core, the inner segments, and the outer segments, that an intriguing and interesting puzzle is provided. The second form of the invention is assembled and held together in a different manner from the first form of the invention and may be preferred if it is desired to associate the outer segments with the inner segments in a more dependable relationship.

It will be evident from the foregoing that by the described movement of the outer segments 30, or 130, relative to the inner segments 19, or 119, and remembering that the core 16, or 116, and the segments are variously colored, that a variety of color combinations and patterns can be obtained. Assuming that certain color patterns are established in advance as the puzzle goals or solutions, it will further be understood that after the segments have been displaced from said established patterns that considerable imagination and color perception are required again to move the segments into the established patterns. Thus, in this manner, a puzzle is provided for challenging the visual acumen, manual dexterity, and patience of the user and providing training in recognizing and associating various colors.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A toy puzzle comprising a core having a substantially spherical smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges, the inner segments having mounting portions providing inner surfaces secured to the core with said inner segments in substantially spherical formation and providing marginal flanges having inner surfaces in radially spaced relation to said outer surface of the core and substantially concentric to the center of the core with adjacent edges of the flanges of adjacent segments being in spaced parallel relation so as to define a plurality of annular intersecting grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having tongue members individually rigidly connected thereto and extended radially inwardly toward the core through said grooves and slidably interlockingly engaging the flanges of the inner surfaces of the inner segments for enabling relative rotatable movement of the first and second sets of outer segments on the inner segments and for enabling collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

2. The puzzle of claim 1 wherein each tongue member includes a leg rigidly connected to the outer segments, and a slide member connected to the leg of its respective tongue, the slide members associated with each set of semi-spherically related outer segments having a collective dimension greater than the minimum width of the grooves but less than the maximum width of the grooves.

3. The puzzle of claim 1 wherein the inner surfaces of the inner segments are cemented to the outer surface of the core.

4. The puzzle of claim 1 wherein the core has a plurality of bores radially inwardly extended from the outer surface of the core and individually located substantially centrally of the outer segments, and wherein pins are individually integrally centrally connected to the inner surfaces of the inner segments, said pins being individually radially inwardly extended into the bores and being adherently connected to the core.

5. A toy puzzle comprising a core having a substantially spherical, smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges meeting in apices, the inner segments having mounting portions integral with the core with said inner segments in substantially spherical formation and providing marginal flanges having inner surfaces in radially spaced relation to said outer surface of the core and substantially concentric to the center of the core with adjacent edges of the flanges of

adjacent segments and being in spaced parallel relation so as to define a plurality of annular intersecting grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlaying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having a plurality of pairs of diametrically oppositely related sets of adjacent apices at opposite poles of the core; and a tongue member rigidly connected to each apex of each outer segment and extended radially inwardly toward the core into said grooves for enabling relative rotatable movement of the first and second sets of outer segments on the inner segments and for enabling collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

6. A toy puzzle comprising a core having a substantially spherical smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges meeting in apices, the inner segments having inner surfaces, mounting portions complementarily secured to the outer surface of the core, and flanges marginally outwardly extended from the mounting portions and terminating in the side edges of the inner segments, the inner segments being thereby connected to the core in concentric substantially spherical formation thereabout with the flanges in

radially spaced relation to the core and adjacent edges of adjacent segments being in spaced parallel relation and defining a plurality of annular intersecting T-shaped grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlaying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having oppositely diametrically related first and second sets of adjacent apices at opposite poles of the core; and tongues individually connected to the apices of the first and second sets of apices and extended radially inwardly toward the core into said grooves between said adjacent side edges and thence transversely under the flanges between said flanges and the core, the tongues being slidable between the flanges and the core for movement in the grooves to enable relative rotatable movement of the first and second sets of outer segments on the inner segments and to enable collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

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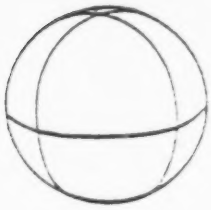
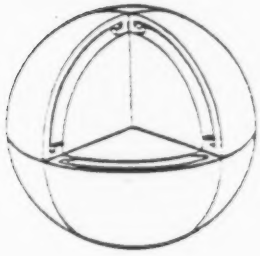
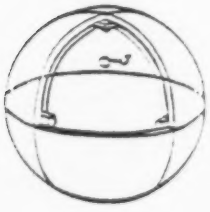
第1図　A



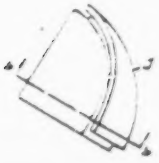
第1図　B



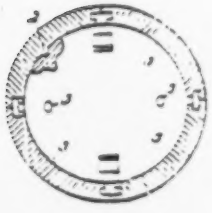
第2図　A



第2図　B

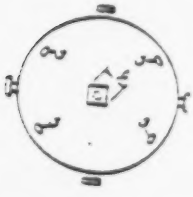


第3図　A



第3図　B

第4図　A



第4図　B

第5図　A

第5図　B

第6図　A

特　許　庁　　特許出願公告

120 D 0

特　許　公　報　　昭38－10669

公告 昭38.5.28　出願 昭36.1.13　特願 昭36－800

優先権主張 1960.2.2（アメリカ国）

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図面の簡単な説明

図面はこの発明によるパズル玩具の二つの実施例を示し、図番に夫々A，Bを添えて示す。

第1図Aは完成品を示す。第2図Aは内部工作を示すための基礎要素の一つを立体に描いた未完成品を示す。第3図Aは内部工作を示すための基礎要素の四つを立体に描いた未完成品を示す。それは実際のパズルを手付かずない位置に回動される。第4図Aはパズルが作られる半球入的球面外形の外方正面を表現するピンを有する内方球を示す。球は中空であり得る。第5図Aはパズルの八つの基礎要素の一つを示す。第6図は第5図の断面を示す。

第1図Bは内部工作を示すため内部の八分球の一つ（第2図B）と基礎要素（第5図B）とが立体に描かれたパズルの図である。第2図Bは基礎要素を埋入的球面外形に支持するために設けられた内方心を形成する八分球の一つの図である。第3図Bは第2図Bと同じ部品を示す他の図である。第4図Bは第5図Bの断面である。第5図Bはパズルの基礎要素四ら一つの球面状三角の図である。これらは八つある。

発明の詳細な説明

この発明はパズル玩具等に種々の色または一クの入つの三角形の球面状三角に切られかつ半球状で互に可動の球面外表に関する。

パズルにおいて多数の部品が通常用いられてある順序または型列を作ることは知られている。そのようなパズルは解答を得るための使用者の忍耐と知識に挑戦する。この発明に関するものはこの型のパズルである。

従つてこの発明の目的は種々な型列を形成するための多数に対し可動の多数のものまたは部品を有するパズル玩具を提供することである。他の目的は可動部品を有する球の形の様で型成される課題を提供することである。別の目的は構造に選択的であり、使用に挑戦し、どの年の人も楽しめられるパズル玩具を提供することである。

これらの詳細は図面についてのこれからの説明の後に明らかとなる。

この発明は二つの実物用型を有る。二つの型は一つの発明を構成していることがいえる。図示された大きは二つの型で同じでないことはパズルがどのような部合のよい大きでもよいから理解がない。

作　用

この発明のA型もB型も同じように操作される。

この操作は容易に明らかであると考えられ、ここに簡単に示される。

半球状に構造されられた四つの三角のどの組も一手で心に押され、その手で他の半球が90度またはその倍数回動された。この種大回動は止め具2（第5図Bに示されている）及び対応凹み3によつて確定的に容易にされ、それらの凹みは外方正面が適当な型列に決められるようにされる。パズルは可使材料（何か適当な可塑性物）である。上の具と凹みとは同様な操作を可能にするようにされる。

この相対的運動は三つの互に直交な軸のどれかについて行われる。これによつて非常に多数の異なつた型列が得られる。

寸法C（第4図A）は寸法4（第5図A）の2倍より大きくなければならない。

寸法4（第5図B）は寸法b（第4図B）の2倍より大きくなければならない。

これは三角が回動される半球面形のままであることを確実にすることになる。

組　立

A型一つのピンは最終の四つの三角が一緒に置かれた孔に置かれなければならない。ピンは孔内で回転される。

B型第5図Bの部分は第2図B部分上に置かれ、第4図Bの外面が第5図Bの内面に接する。これらの八つはある種のジグ内に一緒に置かれ、それから第4図Bのすべての半球は前記ジグ内に保持されている間に固着される。

特許請求の範囲

1　本質的に等しい三角角正分に別られ、埋入的に内方で固着され、半球状に構造された部で三つの相互直交軸のどれかの周の90度またはその倍数回動できる八分球面外表。

Agreed Upon Translation of Gustafson

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Applicant	:	Inventor William Oliver Gustafson E, 2712 Robinson Avenue Ward 3 Fresno, California USA
Representative	:	Patent Agent Goshio Kanamaru and two others

PUZZLE TOY

Brief Explanation of the Drawing

The drawing shows two embodiments of puzzle toys according to this invention. To each drawing number the letter A or B has been appended.

Figure 1A shows a completed article. Figure 2A shows an incomplete article from which there has intentionally been removed one of the basic elements in order to show the construction of the inner part. Figure 3A shows an incomplete article from which there has been intentionally removed four of the basic elements in order to show the construction of the inner part. These have been rotated into an unstable position. Figure 4A shows the inner sphere having pins which permanently maintain the outer facade of the spherical surface after the puzzle has been manufactured. The sphere may be hollow. Figure 5A shows one of the eight basic elements of the puzzle. Figure 6 (sic; should be 6A) shows a cross section of Figure 5 (sic; should be 5A).

Figure 1B is an illustration of a puzzle from which there has intentionally been removed one (Figure 2B) of the eights-of-a-sphere of the inner part and a basic element (Figure 5B) in order to show the construction of the

inner part. Figure 2B is an illustration of one of the eights-of-a-sphere which form an inner core. The inner core is provided in order to maintain the basic elements permanently in the form of an outer spherical surface. Figure 3B is another illustration showing the same component part as Figure 2B. Figure 4B is a cross section of Figure 5B (sic; should be 2B). Figure 5B is an illustration of a basic element: namely, one of the triangles in the form of a spherical surface. There are eight of these.

Detailed Explanation of the Invention

This invention relates to puzzle toys, especially spherical shells which are cut into eight triangles in the form of a triangle-shaped spherical surface having various colors or marks and the exterior surface skin of the sphere is movable in a group making up half of the sphere.

Among puzzles there is known the construction of sequences or arrangements which generally make use of many parts. Such puzzles challenge the patience and knowledge of its users in order to find a solution. This invention relates to this type of puzzle. (Lit.: Things which relate to this invention are this type of puzzle.)

Therefore, an object of this invention is to offer a puzzle toy having many things or parts which are movable with respect to certain groups of them in order to form

various arrangements. Another object is to offer the said apparatus after it has acquired a spherical form having movable parts. A particular object is to offer a puzzle toy which is economical in manufacture, a challenge in use and fascinating for all ages.

These details will become clear upon reading the following explanation in connection with the drawings.

This invention takes on two game forms. One can say that the two forms comprise one invention. The fact that the sizes shown in the drawing are not the same in the two forms is of no significance because the puzzle may be of any convenient size.

Operation

This invention is operated the same whether form A or form B is used.

This operation may easily be thought of as clear and is shown herein simply.

Any group of four triangles which are associated in a hemisphere can be pressed against the core in a "move" of the puzzle, and by that "move" one can rotate the other hemisphere 90° or any multiple thereof. This multiple rotation is easily done positively by means of stops 2 (shown in Figure 5B) and opposing hollow 3; these hollows cause the outer facade to be fixed in a suitable array. The

puzzle is made of flexible material such as a suitable plastic. The stops and hollows make smooth operation possible.

This opposing movement occurs about any of three mutually perpendicular axes. In this way one can have very many different arrangements.

The dimension C (sic) (Figure 4A) must be more than twice as large as the dimension d (Figure 6A).

The dimension a (Figure 5B) must be more than twice as large as the dimension b (Figure 4B).

This means that when triangles are rotated their spherical-surface pattern is maintained.

Construction

One pin of the A form must be placed in the socket after the last of the four triangles have been put together. The pin is affixed inside the socket.

The part shown in Figure 5B of the B form is placed on top of the part shown in Figure 2B. The outer surface of Figure 4B touches the inner surface of Figure 5B. These eight pieces are placed together inside some type of jig, and then all the flat surfaces of Figure 4B are affixed together while they are maintained inside the aforesaid jig.

Patent Claim

(1) Eight-of-a-sphere spherical shells which are divided into essentially equal right-angle, regular triangular parts, which are permanently held to the inside and which can be rotated by 90 degrees or a multiple thereof about any of three mutually perpendicular axes in clusters associated into hemispheres.